#A10 end

29. (NEW) The device of claim 28, wherein relative positions of the means for recording, the means for projecting the reference beam, and the means for projecting the reflected objected beam are fixed.--

---

REMARKS

Favorable reconsideration and allowance of the present patent application are respectfully requested in view of the following remarks. Claim 1-9 were pending prior to the Office Action. Claims have been added by the Reply. Therefore, claims 1-29 are pending. Claims 1, 5, 10, 20, and 24 are independent.

Allowable Subject Matter

Applicants appreciate that the Examiner has indicated claims 2, 6, and 8 as defining allowable subject matter. Applicants note that claim 9, which has been rejected, depends from claim 8. Therefore, Applicants will assume that claim 9 also defines allowable subject matter.

Objection to the Drawings

Drawings were objected to for the following informalities. It was indicated that Figures 1-3 should be designated with a label. A Drawing Change Authorization Request has been filed along with this Reply. As shown,

Figures 1-3 have been labeled "CONVENTIONAL ART." As clearly indicated in the specification, these figures are from Applicants' own previous patent application filed in Norway (Norwegian Application No. 20002601). Therefore, Figures 1-3 do not necessarily qualify as prior art for the purposes of the present application. Applicants respectfully request that the objection to the drawings be withdrawn.

Objection to the Specification

The specification was objected to for the informalities as noted on page 3 of the Office Action. More specifically, the spacer portion of Figures 4-6 is labeled as 30 but is described as element 39 in the specification. The specification has been amended to enhance consistency with the Figures. Applicants respectfully request that the objection to the specification be withdrawn.

35 U.S.C. § 112, 2nd Paragraph Rejection

Claims 1-9 stand rejected under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite. These claims have been amended to address this rejection. Applicants respectfully request that the Section 112, second paragraph rejection of claims 1-9 be withdrawn.

35 U.S.C. § 103 Rejecti n Bas d on H rn

Claims 1 and 3-4 stand rejected under 35 U.S.C. § 103(a) as being obvious over Horn (USPN 5,339,152) ("Horn"). Applicants traverse.

For a Section 103 rejection to be valid, a *prima facie* case of obviousness must be established. *See M.P.E.P. 2142.* One requirement to establish *prima facie case* of obviousness is that the prior art reference must teach or suggest all claim limitations. *See M.P.E.P. 2142; M.P.E.P. 706.02(j).* Thus, if the cited references fail to teach or suggest one or more claimed elements, then the rejection must fail.

It is clear that Horn fails to teach or suggest single-mode light guidance cables as featured in independent claim 1. In addition, Horn does not suggest the desirability of the cables as well. Therefore, Horn fails to teach or suggest at least the above-recited feature.

In the Office Action, it is merely declared that a protective housing and the use of light guidance cables, such as fiber optic cables, for light transmittal is well known and that it would have been obvious to apply a housing and fiber optic cables to the device of Horn to achieve the desired effect.

However, no line of reasoning has been set forth in the Office Action to indicate a manner in which the device of Horn may be modified without teaching away from the claimed inventions or from Horn. In addition, no line of reasoning been provided to indicate modifications would not render Horn

unsatisfactory for its intended purpose. In short, a *prima facie* case of obviousness has not been established.

Therefore, for at least the above stated reasons, independent claim 1 is distinguishable over Horn. Claims 3-4 depend from independent claim 1, directly or indirectly. Therefore, these claims are also distinguishable over Horn for at least the reasons stated with respect to claim 1.

Applicants respectfully request that the rejection of claims 1 and 3-4, based on Horn, be withdrawn.

35 U.S.C. § 103 Rejection Based on Horn and Rockstroh

Claims 5, 7, and 9 stand rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Horn in view of Rockstroh et al. (USPN 6,094,260) ("Rockstroh"). As noted above, claim 9 appears to define allowable subject matter. Therefore, Applicants will treat this as a rejection of claim 5 and 7. As such, Applicants respectfully traverse.

For a Section 103 rejection to be valid, a *prima facie* case of obviousness must be established. *See M.P.E.P. 2142.* One requirement to establish *prima facie case* of obviousness is that the prior art references, when combined, must teach or suggest all claim limitations. *See M.P.E.P. 2142; M.P.E.P. 706.02(j).* Thus, if the cited references fail to teach or suggest one or more elements, then the rejection must fail.

In this instance, independent claim 5 recites, *inter alia*, "light guidance cable." It has been shown above that Horn does not teach or suggest at least this feature. It is also clear that Rockstroh does not teach or suggest at least this feature. Because both Horn and Rockstroh fails to teach or suggest this feature, the combination of Horn and Rockstroh also fails to teach or suggest at least the same feature.

Moreover, Horn and Rockstroh may not be properly combined. Thus any rejection based on a combination of Horn and Rockstroh must fail. Another requirement to establish *prima facie case* of obviousness is that there must be a suggestion or motivation within the cited reference(s) to modify the reference(s) as proposed in the Office Action. *See M.P.E.P. 2143.01.* The cited references must be considered in its entirety including disclosures that teach away from each other or from the invention. *See M.P.E.P. 2142.02.* If any of the cited references teach away, then the combination of the references is improper and cannot be relied upon to reject any claims.

In this instance, Horn teaches away from the invention as well as from Rockstroh. In the Office Action, it is admitted that Horn fails to teach or suggest splitting a light beam into a reference beam and an object beam. *See Office Action, page 6.* It is correctly recognized that instead, Horn discloses a shearing interferometer – a device in which the interference pattern is caused by splitting a collimated beam and phase shifting the bean causing the

constituent parts to interfere. *See Horn, column 1, lines 52-55.* In other words, in Horn, only the reflected beam is split, phase shifted, and recombined. In the Office Action, it is alleged that the shearing interferometer device as disclosed in Horn may be modified with a system that includes splitting of a coherent light source into a reference beam and object beam as disclosed in Rockstroh, to achieve the desired effect.

However, Horn specifically teaches away against using systems with reference beams. Horn states, "Shearing interferometers have the advantage of simplicity and are relatively inexpensive in comparison with systems using external reference beams." *See column 1, lines 55-58.*

Also, Horn is concerned with being able to perform analysis in confined spaces such as a hole for a fastener in metals. *See column 1, line 59 – column 2, line 7.* Thus the bore scope 1 (see Figure) needs to be as simple as possible, i.e. with as few parts as possible. Horn achieves this object by <u>only</u> including a single mirror 2, within the bore scope 1, to direct a source light to the point of reflection 10 and to redirect the reflected light to the prism 16. *Emphasis added.* Clearly, adding additional parts to the bore scope 1 runs contrary to this objective of Horn.

In sum, for reasons of simplicity, less expense, and ability to analyze confined spaces, Horn teaches against the disclosure of Rockstroh, and thus the two references may not be combined.

For at least the above stated reasons, the combination of Horn and Rockstroh fails to establish a *prima facie* case of obviousness with regard to independent claim 5. Therefore, claim 5 is distinguishable over Horn and Rockstroh. Claim 7 depends from independent claim 5. Therefore, for at least the reasons stated with respect to claim 7, claim 7 is also distinguishable over Horn and Rockstroh.

Applicant respectfully requests that the rejection of claims 5 and 7, based on Horn and Rockstroh, be withdrawn.

New Claims

Claims 10-29 have been added through this Reply. All new claims are believed to be distinguishable over the cited references, individually or in any combination. For example, independent claim 10 recites, *inter alia,* light guidance cables, which has been shown to be a distinguishing feature. Independent claim 20 recites a similar feature.

Also independent claim 24 recites, *inter alia,* "probing means to move freely with respect to the controlling means." Clearly, in Horn and Rockstroh, the positions of the differing parts cannot be independent due to the use of prisms and mirrors to direct light. Therefore, for at least this reason, independent claim 4 is distinguishable over Horn and Rockstroh individually or in combination.

Claims 11-19, 21-23, and 25-29 dependent from independent claims 10, 20, and 24. Therefore, these dependent claims are also distinguishable over the cited references for at least the reasons stated with respect to the independent claims.

Applicants respectfully requests that the claims 10-29 be allowed.

CONCLUSION

All objections and rejections raised in the Office Action having been addressed, it is respectfully submitted that the present application is in condition for allowance and such allowance is respectfully solicited. Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Hyung Sohn (Reg. No. 44,346), to conduct an interview in an effort to expedite prosecution in connection with the present application.

Attached hereto is a marked-up version of the changes made to the application by this Reply.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1. 17; particularly, extension of time fees.

Respectfully submitted,

BIRCH, STEWART, KOLASCH & BIRCH, LLP

By: ______________________________

Michael K. Mutter, Reg. No. 29,680

MKM/HNS/sjl/ndb
(703) 205-8000

P.O. Box 747
Falls Church, VA 22040-0747

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION

The paragraph beginning on page 1, line 6, has been amended as follows:

This invention relates to a method and device for non-destructive measurements of residual stresses and loading stresses which is based on optical holographic interferometry technique, where the holographic interferometer is divided into a hand-held holographic probe which is being installed on the object that is to be investigated and a holographic camera which may be situated in a protected in-door environment. The hand-held holographic probe alows to measure residual stresses on surfaces of an object with high curvatures, in [hardly accessible] places <u>where access is difficult</u>, and under many weather conditions by a simple hand-held manual positioning of the holographic probe during the measurements.

The paragraph beginning on page 4, line 7, has been amended as follows:

The first mentioned drawback has been overcome in a device for measuring residual stresses, where a "dislocation" release of the residual stresses was employed (see applicants corresponding Norwegian application no. 20002601). Let us consider this device and stages of its operation in more detail with reference to Figures 1-3. The device [consists of] <u>includes</u> an optical

device (101) and an electronic device for a "dislocation" release of residual stresses (111) with electric current supply electrode (114). The optical device (101) is intended for formation and registration of holograms from an area of the object as well as for formation of interferograms of the above area after releasing the residual stresses. It [consists of] <u>includes</u> a coherent light source (102), a holographic interferometer with optical elements (103-104) for formation of a reference- (105) and object (106) beam, and a recording medium (107). All components in the optical device (101) are rigidly connected with regard to each other. The optical device also [contains] <u>includes</u> a device (108) for positioning and fixation on the object (109). The electronic device for "dislocation" release of residual stresses (111) with an electric current supply electrode and clamping device (114), is intended for non-destructive release of residual stresses within a certain area (the investigation area) of an object. The electronic device comprises a generator (110) which is able to deliver high-current rectangular pulses (pulse parameters are within the range: amplitude 1-10 kA, duration 20 μs - 20 ms and recurrence frequency 0-100 Hz) and an electric current supply electrode with clamping device (114) connected to the generator. The base of the electric current supply electrode is made as a half-sphere with radius 1,5-5 mm. Both the electric current supply electrode (114) and clamping device are located structurally in the optical device (101).

The paragraph beginning on page 10, line 1, has been amended as follows:

The device consists of a holographic probe (1), holographic camera (2), control unit (3), and single-mode light guidance cables (4), (5) and (6). The holographic probe (1) is installed and kept manually by the operator on the investigation area of object (7) during measurements of residual stresses, and it contains a spacer portion [(390)] <u>(30)</u>, two optical connectors (8) and (9) and a current-supply electrode (10) with means (11) for putting it into junction with the surface of the investigation area of the object (7).

The paragraph beginning on page 10, line 19 and ending on page 11, line 3, has been amended as follows:

In addition, the device for measurement of residual stresses includes a minicomputer (12) with display (21) and a printer (22). As one can see from Figs. 4-6, in the preferred embodiment of the invention, the optical connector (17) is connected in one end to the source of coherent light (16), and the other end is connected to the beam splitter of coherent light (18). The single-mode light guidance cable (4) is connected in one end to beam splitter (18), and the other end is connected to optical connector (8). The single-mode light guidance cable (5) is in one end connected to optical connector (9), and the other end is connected to optical connector (13). The single-mode light guidance cable (6) is in one end connected to the beam splitter (18), and the other end is connected

to optical connector (14). The electric cable (23) is in one end connected to the current supply electrode (10) via the contact group (24) and the lever (25), and the other end is connected to the generator of high-current electric pulses located inside the single case (19) of the control unit. The electric cable (26) is in one end connected to the recording medium (15), and the other end is connected to the device for controlling the recording medium operation located inside the single case (19) of the control unit. The electric cable (27) is in one end connected to the source of coherent light (16), and the other end is connected to the power supplier of the coherent light source located inside the single case (19) of the control unit. The electric cable (28) is in one end connected to the TV-camera [(17)] (20), and the other end is connected to the power supplier for the TV-camera (20) located inside the single case (19) of the control unit. The electric cable (29) is in the one end connected to the TV-camera (20), and in the other end to the minicomputer.

The paragraph beginning on page 11, line 4, has been amended as follows:

The holographic probe (1) is installed by an operator on the investigation object in such a manner that optical connector (8) illuminates the investigation area of object (7) (see Fig. 4), and the optical connector (9) collects the light scattered by the investigation area of the object. Optical connectors (13), (14) are located in the holographic camera (2) such that optical connector (13) forms

the object beam (see Fig. 4) and send it to the surface of recording medium (15), and optical connector (14) forms the reference beam and send it to the surface of recording medium (15).

The paragraph beginning on page 11, line 11, has been amended as follows:

In this preferred embodiment of the invention, it is important that the optical connector (17) and the beam splitter of coherent light (18) are rigidly fixed on the coherent light source (16), that the optical connectors (8) and (9) are rigidly connected with regard to each other on the holographic probe (1), that the holographic probe (1) is installed by the operator on the investigation area of the object in such a way that it could not move relative to the investigation area of the object during the investigation, i.e. from the moment of registration of the hologram and until the moment when the interferogram has been formed, and that optical connectors (13), (14) and recording medium (15) are rigidly connected with regard to each other in the holographic camera (2) at fixed distances determined by specific requirements for formation and registration of the hologram. It is also important that the electric current supply electrode (10) is arranged in the holographic probe in such a way that after installing the holographic probe on the investigation area of the object, it could easily be put into junction with the surface of the investigation area of

the object without causing any displacements or vibrations of the holographic probe.

The paragraph beginning on page 11, line 27 and ending on page 12, line 2, has been amended as follows:

Such an embodiment of the device for non-destructive real-time measurement of residual stresses by optical holographic interferometry allows to design the device as [consisting of] <u>comprising</u> two major parts. One of which is the holographic probe installed and kept manually by the operator on the investigation area of the during the measurements, while the other part is the holographic camera situated separately from the investigation object in another place under comfortable conditions. Also, an auxiliary part, the control unit, may be situated separately from the investigation object, in another place, as a rule, together with the holographic camera. In this case, the holographic probe during the measurements can be easily moved by operator along surface of the investigation object within the limits of lengths of single-mode light guidance cables without causing changes in the optical path lengths for the coherent light used for formation of the object and reference beams. And thus, it is allowed to register and develop the hologram and to form the interferogram of the investigation area of the object in comfortable conditions.

The paragraph beginning on page 12, line 20 and ending on page 13, line 3, has been amended as follows:

In the first stage, the registration of the hologram of the investigation area of the object is performed. The holographic probe (1) is installed on the investigation area of the object (7). The [laser] coherent light source (16) is switched on and the recording medium (15) is prepared to make a registration. Coherent light from the [laser] coherent light source (16) is sent [by] through the optical connector (17) to the splitter of coherent light (18), where it is divided into the object- and reference coherent light. The object coherent light is delivered by the single-mode light guidance cable (4) to the optical connector (8) located in the holographic probe (1) where it is expanded and sent onto the investigation area of the object (7). The object coherent light scattered by the investigation area of object (7) is collected by optical connector (9) located in the holographic probe (1) and is sent into the single-mode light guidance cable (5). With the use of the single-mode light guidance cable (5), the object coherent light is delivered to the optical connector (13) located on the holographic camera (2). Further, with the use of optical connector (13), the object coherent beam is formed from the delivered object coherent light and is sent onto the surface of the recording medium (15). At the same time, the reference coherent light is delivered by the single-mode light guidance cable (6)

to the optical connector (14) on the holographic camera (2). Then, with the aid of optical connector (14), the reference beam is formed from the delivered reference coherent light and is directed onto the surface of the recording medium (15). The reference and the object beams interfere on the surface of recording medium (15) and form a hologram of the investigation area of the object. This hologram is registered and developed by the recording medium (15).

IN THE CLAIMS

These claims have been amended as follows:

1. (Amended) A method for performing [non-destructive] measurements of residual stresses in an investigation area of an object by use of optical holographic interferometry technique, in which [initially,] the device used to perform the measurement comprises:

a coherent light source and a registering medium arranged in a environment at a distance from the object which is to be investigated:

a first single-mode light guidance cable that transmits the coherent light from the light source to the investigation area of the object that is to be investigated in such a manner that it illuminates the investigation area;

a second single-mode light guidance cable that transmits the coherent object light, which scatters off the investigation area of the object which is to be

investigated from the investigation area to the registering medium in such a manner that it illuminates the registering medium; and

a stress relieve device that induces a release of the residual stresses at the object in situ while the formation, registration and development of the holographic image and formation of the interferogram of the investigation area of the object are performed in said environment, the method comprising:

[a hologram of the investigation area of the object is registered and developed on a registering medium,] registering and developing a hologram of the investigation area of the object on a registering medium;

[then a small region of the investigation area of the object is subject to a non-destructive dislocation release of the residual stresses,] subjecting a small region of the investigation area of the object to a release of the residual stress; and

[and finally, the registering medium containing the developed holographic image of the investigation area of the object in the initial state and the investigation area of the object containing the region of released residual stresses are simultaneously illuminated with the reference and object beams, respectively, and thus forming an interferogram of the investigation area of the object as a result of interference between the two light waves which corresponds to the light waves scattered off the investigation area of the object before and after release of the residual stresses, characterized in that] forming

an interferogram of the investigation area of the object by simultaneously illuminating the registering medium containing the developed holographic image of the investigation area of the object in the initial state and the investigation area of the object containing the region of released residual stresses with the reference and object beams, respectively, wherein the interferogram is formed as a result of interference between the two light waves which corresponds to the light waves scattered off the investigation area of the object before and after release of the residual stresses.

2. (Amended) [A] The method according to claim 1, [characterized in that the formation of the holographic image and interferogram of the investigation area are protected from mutually relative displacements of the object, holographic camera and/or light source by transporting the coherent light between the object, light source, and holographic camera in single-mode light guidance cables, and by ensuring that the endpoints of the single-mode light guidance cables are securely attached in a fixed distance of the investigation area of the object and the recording medium] further comprising transmitting the coherent light between the object, light source, and holographic camera in single-mode light guidance cables, wherein the endpoints of the single-mode light guidance cables are securely attached in a fixed distance of the investigation area of the object and the recording medium

thereby protecting the formation of the holographic image and interferogram of the investigation area from mutual relative displacements of the object, holographic camera and the light source.

3. (Twice Amended) [A] The method according to claim 1, [characterized in that the non-destructive dislocation release of residual stresses are performed by exposing the investigation area of the object (7) to an electric high current pulse] wherein the step of subjecting the small region of the investigation area of the object to the non-destructive dislocation release of the residual stress includes exposing the investigation area of the object to a electric current pulse.

4. (Twice Amended) [A] The method according to claim 1, [characterized in that the registration and development of the holographic image and formation of the interferogram of the investigation area of the object are performed in a location with a protected environment which is suited for operation of amorphous molecular semiconductors] wherein the step of registering and developing the hologram image and the step of forming the interferogram of the investigation area are performed in an environment suited for an operation of amorphous molecular semiconductors.

5. (Amended) A device for [non-destructive real-time] measurements of residual stresses of an object by optical holographic interferometry technique [which comprises] comprising:

a source of coherent light;[,]

a holographic interferometer;[,]

a recording medium;[,]

a device for [dislocation reslease] release of residual stresses;[,] and

auxillary devices for observing and processing of [the] an interferogram[s], [charactered]

[- in that] wherein the holographic interferometer is divided into a holographic probe [(1) which contains] comprising means for illuminating the investigation area of the object [(7)] by coherent light, collecting the coherent light that scatters off [this] the investigation area and means for performing a [non-destructive dislocation] release of the residual stresses in a small region of the investigation area, and a holographic camera [(2) which contains] comprising means for formation, registration, and development of a hologram and for formation of an interferogram of the investigation area of the object [(7)], and

[- in that] wherein the [object] coherent light is transmitted sent from the light source [(16)] to the probe [(1)] by a first single-mode [node] light guidance cable [(4)], from the holographic probe [(1)] to the holographic camera [(2)] by a

third single-mode light guidance cable [(5)], and the reference coherent light [is sent] transmitted from the light source [(16)] to the holographic camera [(2)] [in] by a second single-mode light guidance cable [(6)].

6. (Amended) [A] The device according to claim 5, [characterized in that] wherein the holographic probe [(1)] comprises a spacer portion [(30)], [two] first and second rigidly connected probe optical connectors [(8), (9)] and an electric current supply electrode [(10)] with means [(11)] for putting [it] the electric current supply electrode into junction with the investigation area of object [(7)], where the first probe optical connector [(8)] is connected to the first single-mode light guidance cable [(4)], the second probe optical connector [(9)] is connected to the third single-mode light guidance cable, and where the electric current supply electrode is connected to [the] a generator of the [high-current electric pulses located in the control unit (3)] by means of electric cables [(23)].

7. (Amended) [A] The device according to claim 6, [characterized in that] wherein the holographic probe [(1) is given] has a narrow cylindrical shape in order to make [it suited] the probe suitable for use in [hardly accessible] difficult to access places and for curved surfaces [on] of the investigation [object (7)]area.

8. (Twice Amended) [A] The device according to claim 6, [characterized in that] wherein the holographic camera [(2)] comprises [two] first and second camera optical connectors [(13), (14)] and a recording medium [(15)] which are rigidly connected and arranged at fixed distances relative to each other, where the first camera optical connector [(13)] is connected to the second single-mode light guidance cable [(5)], and the second camera optical connector [(14)] is connected to the third single-mode light guidance cable [(6)].

9. (Amended) [A] The device according to claim 8, [characterized in that] wherein the first and second single-mode light guidance cables [(4) and (6)] are connected to the source of coherent light [(16)] via [the] a splitter of coherent light [(18) and the optical connector (2)].

Claims 10-29 have been added.